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APPLICATION FOR LETTERS PATENT

**Live Presentation Searching**

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1     **TECHNICAL FIELD**

2             This invention relates to networked client/server systems and to methods of  
3     delivering and rendering live content in such systems. More particularly, the  
4     invention relates to searching for live presentations.

5  
6     **BACKGROUND OF THE INVENTION**

7             The advent of computers and their continued technological advancement  
8     has revolutionized the manner in which people work and live. Information that  
9     used to be available only in written or verbal form is becoming increasingly  
10    available in electronic form. Furthermore, presentations which used to be  
11    available only on particular recording media (e.g., film or tape) or via television  
12    broadcasts are now available in digital form (e.g., over the Internet).

13            One problem encountered by users when faced with this continually  
14    increasing mass of digital information is the ability to locate particular information  
15    that the user is interested in. For example, trying to locate a particular presentation  
16    can be difficult and cumbersome for users. Various search mechanisms exist for  
17    pre-recorded "on-demand" presentations (e.g., various world wide web search  
18    engines). On-demand presentations are fairly easily searchable because the  
19    underlying data of the presentation is already known. However, in the case of live  
20    presentations, such underlying data is not known because, as the presentation is  
21    live, the underlying data is not available yet.

22            Some systems do exist that allow a user to identify scheduled live  
23    presentations. For example, a television programming guide may be available  
24    over the Internet that allows a user to search for television programs that are  
25    scheduled to be broadcast (e.g., via cable, satellite system, or typical television

1 broadcast frequencies, such as UHF or VHF) and their associated broadcast times.  
2 However, such programming guides typically do not provide the flexibility to  
3 allow non-scheduled programs to be identified to the user. Furthermore, such  
4 programming guides are typically limited to television broadcasts and do not allow  
5 users to identify presentations from any of the wide variety of alternate sources  
6 (such as via the Internet).

7 The invention described below addresses these disadvantages, providing a  
8 way to search for live presentations.

## 9 10 **SUMMARY OF THE INVENTION**

11 In a networked client/server system, live presentations can be streamed  
12 from an encoder or other server to a client computer. Additionally, information  
13 describing the presentation is registered with a search server. This information is  
14 made available for user searches only for as long as the information properly  
15 describes the live presentation. When the information no longer describes a  
16 current live presentation, the information is no longer available for searching.

17 According to one aspect of the invention, the information describes the  
18 entire presentation. The information is available in the search server for user  
19 searches for the duration of the presentation. Once the presentation is over, the  
20 information is deleted from the search server, preventing any subsequent user  
21 search requests from being satisfied using the information describing that  
22 presentation.

23 According to another aspect of the invention, the information describes a  
24 particular characteristic(s) of the presentation (e.g., the current topic). The  
25 information for a characteristic is available in the search server for user searches

1 for as long as that characteristic describes the portion of the presentation currently  
2 being presented. Once that characteristic no longer describes the portion currently  
3 being presented, the information describing that characteristic is deleted from the  
4 search server, preventing any subsequent user search requests from being satisfied  
5 using the information describing that characteristic.

6 According to another aspect of the invention, a user can register a  
7 notification request with the search server. The notification request identifies a set  
8 of search criteria as well as a manner in which the user should be notified in the  
9 event a live presentation matches the search criteria. The search server continues  
10 to compare new information regarding available live presentations to the search  
11 criteria. If a match is found, the search server notifies the user in whatever manner  
12 the user requested.

### 13 14 **BRIEF DESCRIPTION OF THE DRAWINGS**

15 Fig. 1 shows a client/server network system and environment in accordance  
16 with one embodiment of the invention.

17 Fig. 2 shows a general example of a computer that can be used in  
18 accordance with the invention.

19 Fig. 3 illustrates an exemplary search server in more detail.

20 Fig. 4 illustrates entries of an exemplary content database in more detail.

21 Fig. 5 shows exemplary steps in a process for allowing searching of live  
22 presentations.

23 Fig. 6 shows exemplary steps in a process for allowing searching of current  
24 characteristics information in live presentations.  
25

## **DETAILED DESCRIPTION**

### **General Network Structure**

Fig. 1 shows a client/server network system and environment in accordance with one embodiment of the invention. Generally, the system includes multiple ( $n$ ) network client computers 102, multiple ( $m$ ) encoders 104, and a search server 106. The computers 102, encoders 104, and server 106 communicate with each other over a data communications network. The communications network in Fig. 1 is a public network 108, such as the Internet. The data communications network might also include local-area networks and/or private wide-area networks, and can include both wired and wireless sections. Client computers 102, encoders 104, and server 106 can communicate with one another via any of a wide variety of known protocols, such as the Hypertext Transfer Protocol (HTTP).

Encoders 104 receive live content or presentations in the form of different media streams 110. Encoders 104 can be dedicated media servers, or alternatively other more general-purpose computer systems. These media streams 110 can be individual media streams (e.g., audio, video, graphical, etc.), or alternatively can be composite media streams including two or more of such individual streams. The media streams 110 are provided to encoders on a "live" basis from other data source components through dedicated communications channels or through the Internet itself. Encoders 104 coordinate the streaming of the live content to other components on the network 108 that request the content, such as client computers 102. It is to be appreciated that although the media streams are referred to as being "live", there may be a delay (e.g., between one second and thirty seconds)

1 between the time of the actual event and the time the media streams reach the  
2 encoder(s).

3 There are various standards for streaming media content and composite  
4 media streams. "Advanced Streaming Format" (ASF) is an example of such a  
5 standard, including both accepted versions of the standard and proposed standards  
6 for future adoption. ASF specifies the way in which multimedia content is stored,  
7 streamed, and presented by the tools, servers, and clients of various multimedia  
8 vendors. ASF provides benefits such as local and network playback, extensible  
9 media types, component download, scalable media types, prioritization of streams,  
10 multiple language support, environment independence, rich inter-stream  
11 relationships, and expandability. Further details about ASF are available from  
12 Microsoft Corporation of Redmond, Washington.

13 Encoders 104 can transmit any type of presentation over the network 108.  
14 Examples of such presentations include audio/video presentations (e.g., television  
15 broadcasts or presentations from a "NetShow™" server (available from Microsoft  
16 Corp. of Redmond, Washington)), video-only presentations, audio-only  
17 presentations, graphical or animated presentations, etc.

18 Search server 106 maintains a content database 112, a notification database  
19 114, and a scheduled presentations database 116. In content database 112, server  
20 106 maintains descriptive information regarding the current live content available  
21 from encoders 104. A user of a client computer 102 can access search server 106  
22 to search for particular live content. In notification database 114, server 106  
23 maintains information regarding users of client computers 102 that have registered  
24 to be notified when particular live content is available. In scheduled presentations  
25

1 database 116, server 106 maintains information regarding future live presentations  
2 that have been registered with server 106.

### 3 4 **Exemplary Computer Environment**

5 In the discussion below, the invention will be described in the general  
6 context of computer-executable instructions, such as program modules, being  
7 executed by one or more conventional personal computers. Generally, program  
8 modules include routines, programs, objects, components, data structures, etc. that  
9 perform particular tasks or implement particular abstract data types. Moreover,  
10 those skilled in the art will appreciate that the invention may be practiced with  
11 other computer system configurations, including hand-held devices,  
12 multiprocessor systems, microprocessor-based or programmable consumer  
13 electronics, network PCs, minicomputers, mainframe computers, and the like. In a  
14 distributed computer environment, program modules may be located in both local  
15 and remote memory storage devices.

16 Alternatively, the invention could be implemented in hardware or a  
17 combination of hardware, software, and/or firmware. For example, the invention  
18 could be implemented in one or more application specific integrated circuits  
19 (ASICs).

20 Fig. 2 shows a general example of a computer 142 that can be used in  
21 accordance with the invention. Computer 142 is shown as an example of a  
22 computer that can perform the functions of any of client computers 102, server  
23 encoders 104, or server 106 of Fig. 1.

Computer 142 includes one or more processors or processing units 144, a system memory 146, and a system bus 148 that couples various system components including the system memory 146 to processors 144.

The bus 148 represents one or more of any of several types of bus structures, including a memory bus or memory controller, a peripheral bus, an accelerated graphics port, and a processor or local bus using any of a variety of bus architectures. The system memory includes read only memory (ROM) 150 and random access memory (RAM) 152. A basic input/output system (BIOS) 154, containing the basic routines that help to transfer information between elements within computer 142, such as during start-up, is stored in ROM 150. Computer 142 further includes a hard disk drive 156 for reading from and writing to a hard disk, not shown, a magnetic disk drive 158 for reading from and writing to a removable magnetic disk 160, and an optical disk drive 162 for reading from or writing to a removable optical disk 164 such as a CD ROM or other optical media. The hard disk drive 156, magnetic disk drive 158, and optical disk drive 162 are connected to the system bus 148 by an SCSI interface 166 or some other appropriate interface. The drives and their associated computer-readable media provide nonvolatile storage of computer readable instructions, data structures, program modules and other data for computer 142. Although the exemplary environment described herein employs a hard disk, a removable magnetic disk 160 and a removable optical disk 164, it should be appreciated by those skilled in the art that other types of computer readable media which can store data that is accessible by a computer, such as magnetic cassettes, flash memory cards, digital video disks, random access memories (RAMs) read only memories (ROM), and the like, may also be used in the exemplary operating environment.



A number of program modules may be stored on the hard disk, magnetic disk 160, optical disk 164, ROM 150, or RAM 152, including an operating system 170, one or more application programs 172, other program modules 174, and program data 176. A user may enter commands and information into computer 142 through input devices such as keyboard 178 and pointing device 180. Other input devices (not shown) may include a microphone, joystick, game pad, satellite dish, scanner, or the like. These and other input devices are connected to the processing unit 144 through an interface 182 that is coupled to the system bus. A monitor 184 or other type of display device is also connected to the system bus 148 via an interface, such as a video adapter 186. In addition to the monitor, personal computers typically include other peripheral output devices (not shown) such as speakers and printers.

Computer 142 operates in a networked environment using logical connections to one or more remote computers, such as a remote computer 188. The remote computer 188 may be another personal computer, a server, a router, a network PC, a peer device or other common network node, and typically includes many or all of the elements described above relative to computer 142, although only a memory storage device 190 has been illustrated in Fig. 2. The logical connections depicted in Fig. 2 include a local area network (LAN) 192 and a wide area network (WAN) 194. Such networking environments are commonplace in offices, enterprise-wide computer networks, intranets, and the Internet. In the described embodiment of the invention, remote computer 188 executes an Internet Web browser program such as the "Internet Explorer" Web browser manufactured and distributed by Microsoft Corporation of Redmond, Washington.

When used in a LAN networking environment, computer 142 is connected to the local network 192 through a network interface or adapter 196. When used in a WAN networking environment, computer 142 typically includes a modem 198 or other means for establishing communications over the wide area network 194, such as the Internet. The modem 198, which may be internal or external, is connected to the system bus 148 via a serial port interface 168. In a networked environment, program modules depicted relative to the personal computer 142, or portions thereof, may be stored in the remote memory storage device. It will be appreciated that the network connections shown are exemplary and other means of establishing a communications link between the computers may be used.

Generally, the data processors of computer 142 are programmed by means of instructions stored at different times in the various computer-readable storage media of the computer. Programs and operating systems are typically distributed, for example, on floppy disks or CD-ROMs. From there, they are installed or loaded into the secondary memory of a computer. At execution, they are loaded at least partially into the computer's primary electronic memory. The invention described herein includes these and other various types of computer-readable storage media when such media contain instructions or programs for implementing the steps described below in conjunction with a microprocessor or other data processor. The invention also includes the computer itself when programmed according to the methods and techniques described below. Furthermore, certain sub-components of the computer may be programmed to perform the functions and steps described below. The invention includes such sub-components when they are programmed as described. In addition, the invention described herein

1 includes data structures, described below, as embodied on various types of  
2 memory media.

3 For purposes of illustration, programs and other executable program  
4 components such as the operating system are illustrated herein as discrete blocks,  
5 although it is recognized that such programs and components reside at various  
6 times in different storage components of the computer, and are executed by the  
7 data processor(s) of the computer.

### 8 9 Search Server

10 Fig. 3 illustrates an exemplary search server in more detail. Search server  
11 106 includes a query interface 210, a registration interface 212, a search engine  
12 214, and a database controller 216. Client computers 102 (Fig. 1) communicate  
13 with search server 106 via query interface 210. Query interface 210 allows users  
14 of client computers 102 to enter search criteria for live content. Upon receipt of a  
15 search request via query interface 210, search engine 214 accesses content  
16 database 112 to search for live content that matches the search criteria.

17 Encoders 104 (Fig. 1) communicate with search server 106 via registration  
18 interface 212. Registration interface 212 allows encoders 104 to provide  
19 descriptive information regarding the live content that they can stream to client  
20 computers. This descriptive information can then be added to content database  
21 112 and used for searches by search engine 214. Descriptive information can be  
22 maintained by server 106 for any live content that can be provided by encoders  
23 104.

Database controller 216 manages the databases 112, 114, and 116. This management includes both adding entries to and removing entries from databases 112, 114, and 116.

Live content or presentations available from encoders 104 can be either pre-scheduled or non-scheduled. Pre-scheduled presentations refer to presentations that have been registered with search server 106 as occurring in the future (e.g., not already in progress and not starting within the next five minutes). Descriptive information regarding pre-scheduled presentations (e.g., presentation title, key words describing the content of the presentation, and encoder(s) from which the presentation will be available) can be provided to server 106 from one of the encoders 104 or some other source, either via the network 108 (Fig. 1) or alternatively some other delivery mechanism (e.g., a magnetic or optical disk).

Non-scheduled presentations refer to presentations that have not been registered with search server 106 as occurring in the future. A non-scheduled presentation is registered with server 106 as the presentation is about to begin (e.g., within the next five minutes) or shortly after it has begun. The presentation can be registered by an encoder 104 (e.g., the encoder 104 that will be streaming the live content), or alternatively some other source. As part of the registration process, server 106 is provided with descriptive information regarding the presentation.

Fig. 4 illustrates entries of an exemplary content database in more detail. Fig. 4 is described with additional reference to components in Fig. 3. Each entry in content database 112 includes data for one or more of the following fields: title 230, source 232, duration 234, current characteristic(s) 236, and descriptive information 238. Content database 112 can be stored in volatile memory (e.g.,

1 RAM), non-volatile memory (e.g., a magnetic disk drive), or a combination  
2 thereof.

3 Title field 230 includes a descriptive title of the presentation. Source field  
4 232 identifies the encoder(s) 104 from which the presentation can be obtained.  
5 Duration field 234 identifies, for some entries, the duration of the presentation; in  
6 other entries, the duration data is not included. Characteristics field 236 optionally  
7 identifies the current characteristics for the presentation (i.e., one or more  
8 characteristics describing the portion of the presentation currently being presented  
9 or about to be presented). Any of a wide variety of characteristics can be included  
10 for the presentation, such as the current topic (as illustrated in Fig. 4), the name of  
11 the current speaker, the gender of the current speaker, the color of the current  
12 speaker's clothing, etc. Descriptive information field 238 provides various  
13 descriptive information that describes the content of the presentation.

14 Content database 112 maintains information identifying each of the  
15 currently available live presentations that is registered with server 106.  
16 Information regarding pre-scheduled presentations that are not currently available  
17 (or shortly will be available) from an encoder 104 is maintained in scheduled  
18 database 116. Alternatively, such information could be included in content  
19 database 112 and simply marked as "invalid" until the presentation is available  
20 from an encoder 104.

21 In the illustrated example, each current live presentation has an associated  
22 entry in database 112. When a pre-scheduled presentation is about to begin (e.g.,  
23 it is scheduled to begin shortly, such as within two minutes), database controller  
24 216 (Fig. 3) loads descriptive information corresponding to the presentation into  
25 an entry of database 112. In the case of pre-scheduled presentations, this

descriptive information is loaded from pre-scheduled presentations database 116. In the case of non-scheduled presentations, this descriptive information is received directly from registration interface 212.

When a presentation is over, the entry in database 112 corresponding to the presentation is deleted. Server 106 is provided with an indication of the duration of a live presentation from the encoder or other device that registered the presentation with server 106. In one implementation, this indication of the duration is a time period or "run time" for the presentation. For example, an encoder may indicate that a particular live presentation is going to be available between 2:00 p.m. and 4:00 p.m. on January 1, 2000, or that a particular live presentation is going to last for 45 minutes. Database controller 216 monitors content database 112 for presentations whose time period or "run time" has passed, and deletes the corresponding entries from database 112. According to another implementation, this indication of the duration of the presentation is simply a "presentation over" message or similar indicator. For example, an encoder may register for a current live presentation, and then send a "presentation over" message to the server 106 when the presentation has completed. Upon receipt of the "presentation over" message, database controller 216 deletes the entry corresponding to the presentation from database 112.

In one implementation of the invention, database controller 216 also includes a timeout control that monitors the length of time that entries have been in database 112. If a "presentation over" message is not received for a live presentation within a default period of time, then controller 216 assumes that a "presentation over" message was mistakenly not sent (or was lost in transit) and removes the entry corresponding to the live presentation from database 112.

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1        Additionally, in another implementation of the invention a presentation that  
2 is scheduled for a particular duration (e.g., 90 minutes, or from 2:00 p.m. to 4:00  
3 p.m.) may be extended. The duration can be extended by the encoder 104 (or  
4 other device) sending a message to server 106 to change the duration in the  
5 corresponding entry of database 112. For example, the message may indicate to  
6 change "90 minutes" to "110 minutes", or to change "2:00 p.m. to 4:00 p.m." to  
7 "2:00 p.m. to 5:00 p.m.". Alternatively, the duration may be extended by the  
8 encoder 104 (or other device) sending a message to server 106 indicating that  
9 server 106 is to ignore the previously identified duration and that a "presentation  
10 over" message or similar indicator will be transmitted to server 106 when the  
11 presentation is over.

12        The descriptive information field 238 of an entry includes data that  
13 describes the content of the corresponding presentation. In the illustrated example  
14 of Fig. 4, the data includes a set of one or more key words describing the  
15 presentation. Alternatively, the data could include a summary or abstract of the  
16 presentation, or a textual transcript of the presentation.

17        The data for descriptive information field 238 can be generated manually or  
18 automatically. Manual generation refers to an individual (e.g., the presentation  
19 author) creating the data. For example, the author may write a summary or a list  
20 of key words for the presentation and provide them to server 106 (either directly or  
21 via an encoder 104).

22        Automatic generation refers to one of the components, such as an encoder  
23 104 or server 106, using any of a variety of mechanisms to generate data  
24 describing the presentation as the presentation occurs. For example, conventional  
25 key word generation processes may be employed to identify key words from the

1 presentation. This may be carried out by an encoder 104, server 106, or some  
2 other component coupled to network 108. By way of another example, closed  
3 captioning information may be used as the data, or conventional speech-to-text  
4 conversion techniques may be used to convert audio data into text data.

5 The information maintained in content database 112 is used by search  
6 engine 214 to respond to search requests received from users of a client computer  
7 102 (Fig. 1). A user provides, as part of his or her search request, a set of search  
8 criteria and which fields the search criteria should be applied to. The user can  
9 provide search requests via any of a wide variety of conventional input  
10 mechanisms, such as a graphical user interface (GUI). In the illustrated example,  
11 the user is able to search any of the fields in content database 214. Search engine  
12 214 compares the user-provided search criteria to each entry in the database 112 to  
13 determine whether the presentation corresponding to the entry satisfies the search  
14 request. Any of a variety of conventional searching algorithms and methodologies  
15 can be used. For example, any entry with at least one word matching one of the  
16 search criteria may satisfy the search request, an entry may be required to include  
17 every word in the search criteria in order to satisfy the search request, etc.

18 Information regarding presentations that satisfy a search request are  
19 provided to the client computer 102 of the user that placed the request. Such  
20 information may be the entire entry from database 112, or alternatively a selected  
21 portion (e.g., the title field 230 and source field 232 for the entry). The source  
22 field 232 is provided to the client computer to allow the user to subsequently  
23 request the presentation, via the client computer, from the appropriate encoder  
24 104. In the illustrated example, the data in source field 232 comprises a uniform  
25



1 resource locator (URL) that identifies a particular presentation available from a  
2 particular encoder.

3 Information from each entry that satisfies the search criteria is provided to  
4 the user and, if multiple entries satisfy the each criteria, then the user can select  
5 one or more presentations based on this information. Alternatively, server 106  
6 may rank the entries based on how well they match the search criteria and return  
7 information for only the highest ranking entry (or entries) to the user.

8 In addition to information describing the overall content of the presentation,  
9 current "characteristic" information is also (optionally) included in database 112.  
10 Characteristic information describing one or more current characteristics of the  
11 presentation is registered with search server 106 by the encoder 104. When one or  
12 more of the current characteristics changes, the encoder 104 registers the new  
13 current characteristic(s) with server 106. Server 106, in response, changes the  
14 entry in content database 112 corresponding to the presentation to identify the new  
15 current characteristics (e.g., by replacing one or more of the current characteristics  
16 or by adding a new characteristic(s)). By continually updating the current  
17 characteristics, a user can search for particular characteristics without regard for  
18 which actual presentation includes the characteristics. For example, a user may be  
19 interested in discussions of Microsoft Corporation and can search for the  
20 characteristics "Microsoft" or "Bill Gates" across multiple presentations registered  
21 with server 106.

22 A current characteristic has a duration analogous to that of the presentation  
23 discussed above. Each characteristic may have its own duration, or multiple  
24 characters for a presentation may have the same duration. The duration of the  
25 characteristics can be identified explicitly (e.g., the author may indicate that

1 Microsoft Corporation will be discussed from 2:07 p.m. to 2:12 p.m., or that the  
2 current characteristic of Microsoft Corporation will be accurate for the next seven  
3 minutes, or a "characteristic over" indicator (such as a "cancel characteristic"  
4 message) may be transmitted to server 106 from encoder 104). Alternatively, the  
5 duration of the characteristics can be identified implicitly (e.g., the previous  
6 current characteristics are over when new current characteristics information is  
7 received).

8 Current characteristics data can also be generated either manually or  
9 automatically, analogous to the generation of data for descriptive information field  
10 238 discussed above. For example, an algorithm may use closed captioning data  
11 or a speech-to-text conversion algorithm to obtain a textual version of the  
12 presentation. Key words can then be identified from the textual version and if  
13 their frequency is high enough (e.g., the word "Microsoft" occurs at least a  
14 threshold number of times, such as ten, within a period of time, such as sixty  
15 seconds or every 500 words), then those key words are identified as the current  
16 topic data.

17 Current characteristics information can be deleted from database 112 in an  
18 immediate manner. That is, as soon as new current characteristics data is received,  
19 the previous current characteristics data is deleted. Alternatively, the current  
20 characteristic information may be "aged out" of database 112 gradually. For  
21 example, if new current characteristics are identified and the key words that  
22 caused the identification of the previous current characteristics are not detected  
23 within a threshold amount of time (e.g., ten minutes), then the previous current  
24 characteristics are deleted from database 112. This aging out can be implemented  
25

1 by server 106, or alternatively can be used by encoder 104 in determining when to  
2 transmit a "characteristic over" indicator to server 106.

3 Thus, using characteristics, it can be seen that the results of a search request  
4 can vary depending on when during the presentation the search request is made.

5 Alternatively, the current characteristics for a presentation can be displayed  
6 to the user rather than used for searching. For example, a user may submit a  
7 search request that results in multiple live presentations with descriptive  
8 information 238 satisfying the search criteria. Search server 106 transmits the  
9 current characteristics for each of these matching live presentations (as well as  
10 other information, such as title 230) to client 102 for display to the user. Search  
11 server 106 also transmits any changes in the current characteristics for these  
12 matching live presentations to client 102. Thus, client 102 presents to the user a  
13 continually updating display of the current characteristics of the live presentations  
14 that satisfy his or her search request.

15 Database controller 216 also maintains notification database 114. A user  
16 can register a "notification request" with server 106 that includes a search request  
17 and a notification type. The search request includes the user's search criteria and  
18 the notification type identifies how the user wants to be notified in the event a live  
19 presentation begins that matches the search criteria. In one implementation, a user  
20 can register an email address, a pager number, a cellular phone (or other  
21 telephone) number, etc.

22 Database controller 216 receives the notification request and places the  
23 search criteria and notification type in notification database 114. Database  
24 controller 216 also invokes search engine 214 to determine whether any current  
25 entry in content database 112 satisfies the search criteria. If a match is found, then

1 the user is notified in a manner according to the notification type. The notification  
2 request may then be removed from notification database 114, or alternatively left  
3 in notification database 114 to detect subsequent matches.

4 If a match is not immediately found, then database controller 216 continues  
5 to invoke search engine 214 each time new information is placed in content  
6 database 112. Once invoked, search engine 214 determines whether the new  
7 information results in an entry that matches any of the search criteria of  
8 notification requests in notification database 114. This search may be compared to  
9 all entries in content database 112, or alternatively only to the entries in database  
10 112 that include the new information.

11 Fig. 5 shows exemplary steps in a process for allowing searching of live  
12 presentations. Steps on the left side of dashed line 250 are carried out by an  
13 encoder 104 of Fig. 1, and steps on the right side of dashed line 250 are carried out  
14 by search server 106 of Fig. 1. These steps may be performed in software. Fig. 5  
15 is described with additional reference to components in Fig. 1.

16 Initially, encoder 104 sends identifying information for a current live  
17 presentation to search server 106 (step 252). This identifying information is  
18 received by server 106 (step 254), which records the information and makes the  
19 information available for user searches (step 256). The identifying information is  
20 used by server 106 in responding to any subsequent search requests it receives  
21 (step 258).

22 While server 106 is performing steps 254 – 258, encoder 104 continues to  
23 stream the live presentation to any of the client computers 102 that request it until  
24 the presentation is over (steps 260 and 262). When the presentation is over,  
25

1 encoder 104 stops streaming the presentation to client computers 102 and sends a  
2 "presentation over" indication to server 106 (step 264).

3 Server 106 receives the "presentation over" indication from encoder 104  
4 (step 266) and deletes its record of the identifying information regarding the  
5 presentation (step 268). Thus, any subsequent search requests will not be  
6 compared to the identifying information for that presentation, as that presentation  
7 is over.

8 Alternatively, rather than relying on a "presentation over" indication in step  
9 266, server 106 may be informed of the end of the presentation in other manners  
10 (such as a pre-programmed duration).

11 Fig. 6 shows exemplary steps in a process for allowing searching of current  
12 characteristic information in live presentations. Steps on the left side of dashed  
13 line 280 are carried out by an encoder 104 of Fig. 1, and steps on the right side of  
14 dashed line 280 are carried out by search server 106 of Fig. 1. These steps may be  
15 performed in software. Fig. 6 is described with additional reference to  
16 components in Fig. 1.

17 Initially encoder 104 sends, to search server 106, current characteristic(s)  
18 information for the portion of a live presentation currently being presented (step  
19 282). Search server 106 in turn receives the current characteristic(s) information  
20 (step 284). Server 106 records the current characteristic(s) information and makes  
21 the information available for searching (step 286). The characteristic(s)  
22 information is used by server 106 in responding to any subsequent search requests  
23 it receives (step 288).

24 While server 106 is performing steps 284 – 288, encoder 104 continues to  
25 stream the live presentation to any of the client computers 102 that request it (step

290). Encoder 104 also checks whether the current characteristic(s) are over (step 292). When the current characteristic(s) are over (e.g., they no longer describe the portion of the live presentation currently being presented), encoder 104 sends a "characteristic(s) over" indication to server 106 (step 294).

Server 106 receives the characteristic(s) over indication from encoder 104 (step 296) and deletes its record of the characteristic(s) information (step 298). Thus, any subsequent search requests will not be compared to the characteristic(s) information for that presentation, as those characteristic(s) are over.

### **Conclusion**

The invention allows for the searching of live presentations. An encoder providing a live presentation registers with a search server, advantageously making information identifying the presentation available for searching only for the duration of the presentation. Additionally, characteristic information identifying current characteristic(s) of the presentation can be registered with the search server only for the duration of that characteristic(s). Thus, the characteristic information is advantageously made available for only as long as that characteristic(s) describes the current portion of the live presentation.

Although the invention has been described in language specific to structural features and/or methodological steps, it is to be understood that the invention defined in the appended claims is not necessarily limited to the specific features or steps described. Rather, the specific features and steps are disclosed as preferred forms of implementing the claimed invention.